

Claims

We claim:

- 1 1. A method for detecting an unusual event in a video, comprising:
 - 2 extracting motion vectors from each frame in a video;
 - 3 determine zero run-length parameters for each frame from the motion
 - 4 vectors;
 - 5 summing the zero run-length parameters over predetermined time intervals
 - 6 of the video;
 - 7 determining a distance between the sum of the zero run-lengths of a current
 - 8 time interval and the sum of the zero run-lengths of a previous time interval;
 - 9 signalling the unusual event if the distance is greater than a predetermined
 - 10 threshold.
- 1 2. The method of claim 1 wherein the zero run-length parameters are classified into
- 2 short, medium and long zero run-lengths.
- 3
- 4 3. The method of claim 2 wherein the zero run-length parameters are normalized
- 5 with respect to a width of each frame of the video.
- 6

1 4. The method of claim 2 wherein short zero run-lengths are defined to be one third
2 the width of the frame or less, medium zero run-lengths are greater than one third
3 and less than two thirds of the width of the frame, and long zero run-lengths are
4 equal to or greater than the width of the frame.

Rule 1.126

1 ~~4~~⁵ The method of claim 1 wherein the zero run-length parameters express the
2 number, size, and shape of distinct moving objects in the video.

1 ~~5~~⁶ The method of claim 2 wherein the distance is an absolute difference of the short
2 run-lengths sums.

1 ~~6~~⁷ The method of claim 2 wherein the distance is a difference of squares of the
2 short and long zero run-lengths.

1 ~~7~~⁸ The method of claim 1 wherein the video is of a scene without moving objects,
2 and the unusual event is a moving object entering the scene in the video.

1 ~~8~~⁹ The method of claim 1 wherein the video is of a scene including vehicle traffic
2 on a highway, and the unusual event is stalled traffic.

1 ~~9~~¹⁰ The method of claim 1 wherein the stalled traffic is due to an out-of-scene
2 accident.

1 ~~10~~¹¹ The method of claim 1 wherein the unusual event is inferred but not directly
2 observed.

12
1 11. The method of claim 1 further comprising:
2 detecting the unusual event in a real-time video.

13
1 12. A system for detecting an unusual event in a video, comprising:
2 a camera acquiring a video of a scene;
3 means for extracting motion vectors from each frame in the video;
4 means for determine zero run-length parameters for each frame from the
5 motion vectors;
6 means for summing the zero run-length parameters over predetermined time
7 intervals of the video;
8 means for determining a distance between the sum of the zero run-lengths of
9 a current time interval and the sum of the zero run-lengths of a previous time
10 interval; and
11 an alarm device for signalling the unusual event if the distance is greater
12 than a predetermined threshold.